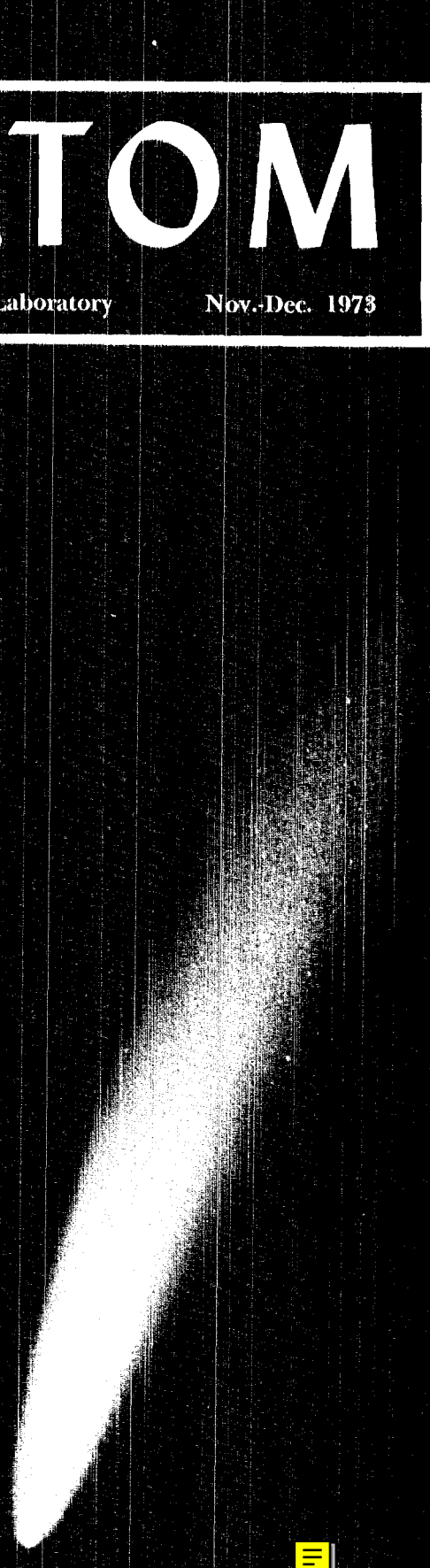
THE ATOM

Los Alamos Scientific Laboratory Nov.-Dec. 1973



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THE ATOM

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NEW EDITOR

Jack Nelson has joined ISD-1 as editor of "The Atom." He replaces Kenneth Johnson who has become group leader of ISD-7.

Formerly advertising and public relations director for Chris Craft Corporation in Pompano Beach, Florida, Nelson has been a free-lance writer and public relations consultant in Santa Fe since 1970. He studied at Mercer University in Macon, Georgia, under the Navy's V-5 program and earned his bachelor of arts degree in journalism from the University of North Carolina in 1948. He and his wife, Jacqueline, live in Santa Fe with their 4 children.

COVER:

Comet Kohoutek, though faintly visible now, is expected to blaze in its fullest glory over New Mexico later this month and in early January. Comet Bennett, shown on the cover, was not as spectacular as Kohoutek is expected to be. Nevertheless, the LASL photo gives *The Atom* readers an excellent preview of the celestial display to come.

Lab gears for

COMET KOHOUTEK

Christmas visitor from outer space

Comet Kohoutek, touted by astronomers as the celestial sight of a lifetime, is the target for an ambitious two-stage study program by the Los Alamos Scientific Laboratory.

The LASL space physics research teams will join what is probably the most ambitious and comprehensive comet watch ever planned by the worldwide scientific community. Early discovery of the incoming visitor from the depths of space nearly 9½ months before its closest approach to the sun allowed scientists to plan a most detailed scrutiny.

The first LASL research team to start the comet watch has set up a 2,000 millimeter (80 inches) focal length telescope at a ground station. Marv Hoffman, J-12 associate group leader, Don Liebenberg, L-DOT, Mort Sanders, and Joe Calligan, both J-12, are recording spectral lines in several regions in an attempt to learn more about the composition of the comet's nucleus. Observations began after Thanksgiving and will continue into late January.

Walt Huebner, T-4 alternate group leader, is also going to be observing on the ground using the 36-foot radio telescope at the Kitt Peak Na-

continued on next page

J-10 astronomer Henry Horak, standing, outlines predictions regarding performance of Kohoutek to members of LASL's space physics research team. Left to right are Ken Olsen, J-9 alternate group leader, Bob Carlos, J-10, and Lew Jones, CNC-4.

tional Observatory in Arizona. Huebner will be looking for evidence of 5 different molecules—HCN, HNC, HNCO, CH_3 C_2 H, and an unknown labelled X-ogen. Presence of the unknown, which has previously been detected in interstellar matter by Buhl and Snyder of the National Radio Astronomy Observatory at Green Bank, West Virginia, would indicate that Kohoutek contains some material from outside our solar system. However, this would not necessarily mean that the comet came from another solar system. But it could help to shed new light on the process by which new stars are formed.

The second phase of LASL's comet research will be carried out aboard an Atomic Energy Commission/Air Force NC-135 flying laboratory. The 4-engine jet will carry scientists on a series of flights beginning December 18 and ending January 22. Between December 18 and December 24 several local area flights will be made from Albuquerque before dawn. On December 26, the aircraft will go to Eielson Air Force Base, near Fairbanks, Alaska. From there 4 flights are planned to look at the comet at noontime just before, during, and immediately after its closest approach to the sun. The aircraft will be flying far enough to the north so that the sun is below the horizon at midday. This flight plan will permit sensitive instruments to probe the comet unhampered by the excessive light scattering of full sunlight.

After returning to Albuquerque on December 31, the LASL flying comet watchers will make several more local area flights after sunset in the period between January 4 to 22. Robert Jeffries, assistant J-10 group leader, is scientific commander for the expedition with Huebner serving as scientific advisor. Air Force mission commander is Lt. Harold Rhoads, of the 4900th Flight Test Group Diagnostics Branch at Kirtland Air Force Base.

Other LASL scientists who will be collecting data to add to man's rather scanty knowledge of the physical and chemical composition of comets are: Sidney Stone, J-10; Charles Keller, acting J-15 group leader; Llewellyn Jones, CNC-4; John Wolcott, J-10; Charles Anderson, J-9; and Robert Carlos, P-10.

Major astronomical observatories throughout the world have been following and will continue to monitor the incoming object. And in the United States, the National Aeronautics and Space Administration is coordinating Operation Kohoutek. This will involve study by Skylab's third crew of astronauts, 2 unmanned orbiting observatories, aircraft, balloons, sounding rockets, the Mariner 10 space probe now speeding toward Venus and Mercury, and many ground-based stations.

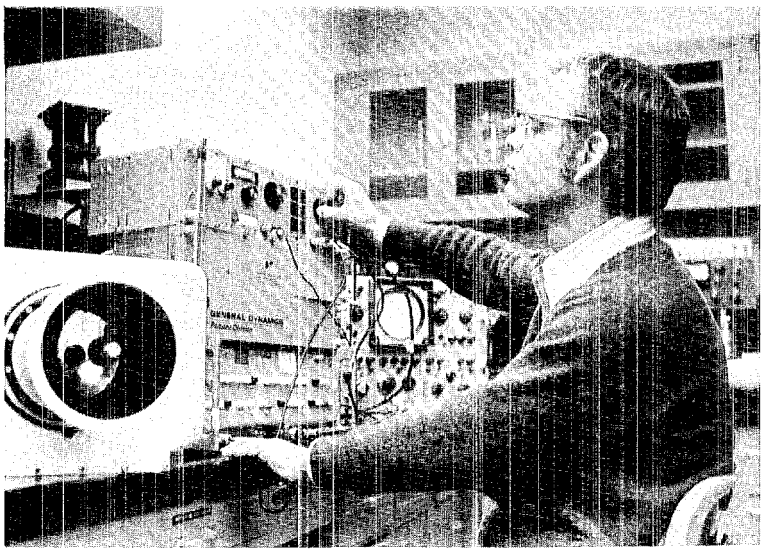
Scientists hope that Kohoutek will help to solve long-standing questions on the physical nature and origin of comets. The comet nucleus is believed to consist of frozen gases or ice and other solid particles. As the comet nears the sun the nucleus vaporizes into a cloud of gas and dust many thousands of miles in diameter. Most scientists believe that comets were formed near the outer planets and that there are billions and billions of comets caught in the deep freeze of the far outer edge of the solar system. However, one cosmologist, A. G. W. Cameron of Harvard University postulates that comets actually originated beyond the orbits of the planets, as part of the same process that created our solar system. If this is so, they should contain matter from outside the solar system.

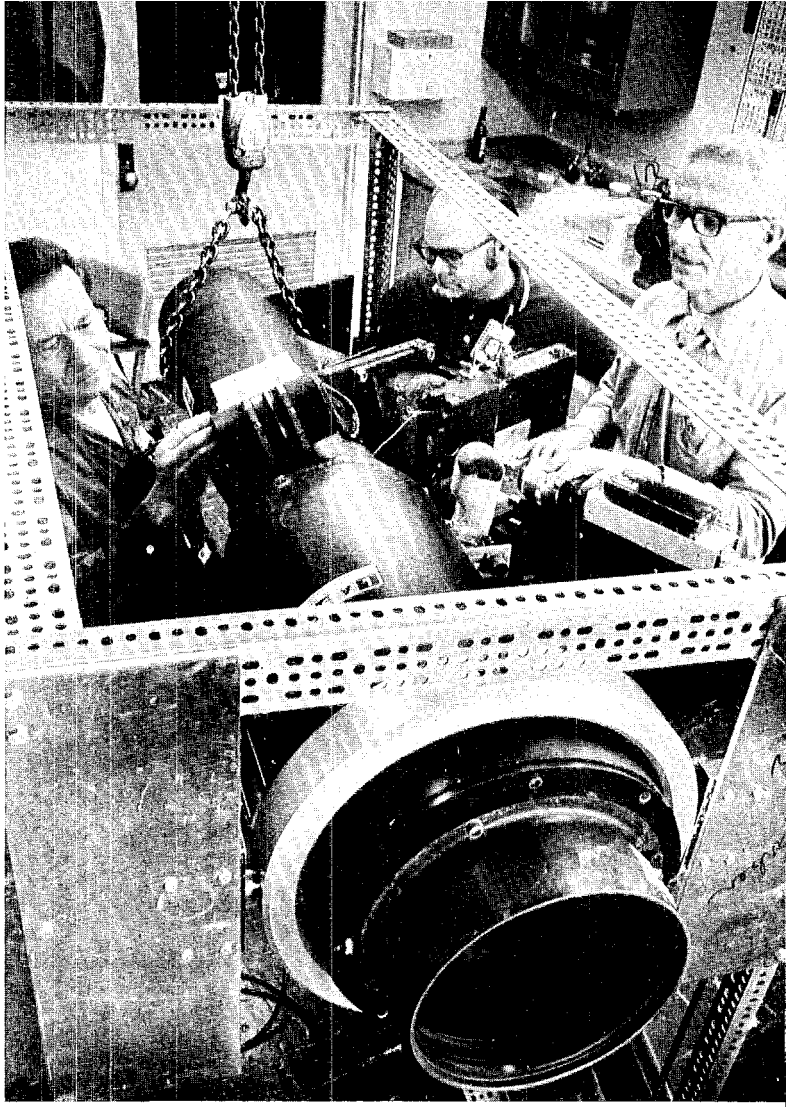
The early discovery of the comet by Lubos Kohoutek of the West Germany Hamburg Observatory, when the comet was still some 600 million kilometers (about 400 million miles) from the sun, suggests that Kohoutek must be a relatively large comet. Its nucleus (solid center) may be 20 to 30 kilometers (12 to 19 miles) in diameter while the head—or coma—may have a diameter of 96,000 kilometers (60,000 miles) or more. Kohoutek's glowing tail could stream across 1/6 of the night sky around New Year's Day for a distance of 80 to 160 million kilometers (50 to 100 million miles).

Comet tails glow brighter and brighter and stream farther and farther out into space as the object passes close enough for the sun's radiation to vaporize and ionize the ice and gases of the head and nucleus. The tail streams out in the direction away from the sun pushed by the force of the solar wind—the constant outpouring of particles from the sun. Each return visit to the sun removes a certain amount of material from the nucleus until it eventually breaks up and disappears.

Kohoutek became visible to the naked eye in the east-southeast (before dawn) the end of November. Its brightness will increase until it becomes the most dazzling object in the sky between Christmas and New Year's, with its peak on about December 28 when it approaches closest to the sun (perihelion). After perihelion it will be moving away from the sun and will be visible in the west-southwestern sky after sunset. Probably the best unaided eye view will be afforded ground observers from January 10 to January 15.

Right, Glen Barber, Joe Calligan, and Marv Hoffman, all J-12, check modifications on the 2,000-mm. telescope which is being used for observations of Comet Kohoutek from a ground station. This same telescope, mounted in a NC-135 flying laboratory, has been used for airborne investigations of solar eclipses since 1965. Below, Lew Jones, CNC-4, prepares an interferometer and its mirror lens optical system for use aboard an AEC/Air Force NC-135 which will carry a LASL research team on a series of flights to collect data on the comet.





Casey Stevens, left, and Rubel Martinez, right, both J-10, check wiring to intensified-image cameras which will record comet data during a number of NC-135 flights beginning in mid-December and continuing into late January.

"We need help"

LASL Tightens Energy Belt

A substantial effort to conserve some of the country's waning energy supply has been undertaken by the Los Alamos Scientific Laboratory under the direction of a newly formed Energy Conservation Committee.

The committee, with E. L. Miller, ENG-4, as chairman, is planning and coordinating both short- and long-range programs for a wide variety of energy economies in an effort to meet the government's goal of a 7 per cent reduction in energy consumption for all federally funded operations. Committee membership, in addition to Miller, includes E. G. Arntzen, ENG-2; D.S. Clayton, SP-2; R. N. Mitchell, H-5; R. I. Ferran, AEC Engineering, Construction and Maintenance; and A. D. Miller, Zia Utilities and Engineering.

Top priority has been given to cutbacks in lighting, heating, and cooling because savings in these areas are easiest to achieve and simplest to monitor.

An 11 per cent reduction in the use of electrical power already has been achieved and a 14 per cent reduction is expected to be realized by January 1 when the program is completed. This percentage is based on the Laboratory's estimated average use of 35 megawatts per hour and includes the anticipated heavy load increases as the Clinton P. Anderson Los Alamos Meson Physics Facility comes on the line, according to Robert Bowyer, ENG-4.

A significant part of this saving has been made by reducing the use of some 30,000 incandescent light bulbs, totaling 6 megawatts, by 65 per cent, and 100,000 fluorescent tubes, burning approximately 7.5 megawatts, by 20 per cent. Other savings include the elimination of nearly 400 horsepower by turning off hoods, exhaust systems, and compressors found to be unnecessary on a full-time basis. Plans also are being made to lower the temperature of electrically heated water from 160 degrees to 125 degrees wherever feasible.

"If we can get everyone who has an electric space heater to give it up, we'll save an additional 4 to 5 per cent," Bowyer said. "We'd also like to make some recommendations for the consolidation of hot plates and coffee pots."

Thermostats throughout the Laboratory will be lowered to 70 degrees for the winter and air-conditioned summer temperatures will be raised to 76 degrees. The U.S. Bureau of Standards has estimated that such 5-degree changes, though they appear small, can represent a utility saving of about 9 per cent, but estimates for savings within the Laboratory are not yet available.

While the immediate reductions are being affected, the Energy Conservation Committee is working with representatives from each Laboratory group in surveying all facilities to determine where other economies can be made. According to Chairman Miller, the committee will check out gas, electrical, mechanical, steam, and water systems and transportation facilities for potential cutbacks and determine what unoccupied buildings and rooms can be closed down. He pointed out that economy measures will be taken only where they do not interfere with the programmatic activities of the user group.

Once the survey is complete, the committee will recommend measures for further immediate savings and establish recommendations for other programs to be implemented in the event of a crisis. "We're preplanning for the time when tighter, mandatory restrictions are put into effect," Miller said.

"We are talking about a fact of life," he emphasized. "The energy shortage is here and it can affect everyone." Miller urged that Laboratory employees who see ways in which savings can be made in their own areas should contact him at 667-4657.

"We need the help of everyone in the Laboratory," Miller said, "but voluntary action may not be enough."

Fill 'er Up, Doc

cryogenics team seeks ways to use hydrogen in your tank

Will hydrogen keep us driving after the gasoline is gone? And if so, how can it be handled to provide an efficient, safe, and practical fuel for transportation?

In a spare-time, nonfunded effort in the Los Alamos Scientific Laboratory's Q-Division, Fred Edeskuty, associate Q-26 group leader, Walter Stewart and Robert Candler, Q-26, are hoping to find a few of the answers to this complex problem by driving a pickup truck, powered by liquid hydrogen, around the group's parking lot and beyond.

With some simple modifications to the standard internal combustion engine, the truck is able to operate on hydrogen. The addition of an elaborate array of instrumentation will enable the scientists to collect valuable data to learn how a hydrogen-powered engine functions and how the problems associated with hydrogen fuel may be overcome.

The truck presently operates on compressed gas stored in 4 standard 220-cubic-foot laboratory bottles connected in sequence and carried in the truck bed. The shift to liquid hydrogen will be made as soon as a specially designed and built storage dewar (a giant thermos bottle) is received.

"The use of hydrogen looks like the most straightforward way to continue to have transportation after the fossil fuels are exhausted," Edeskuty said. Hydrogen is plentiful, nonpolluting, and efficient, and production, trucking, and redistribution of hydrogen have been done routinely for years and offer no difficulties. There are, however, some problems, the most serious of which is on-board vehicle storage. The use of liquid hydrogen appears to offer a good solution to this.

Hydrogen can be carried in automobiles in several forms—as compressed gas, as a cryogenic liquid, or as a metallic hydride—but to store any one of these requires a great deal of weight and volume compared with conventional gasoline.

A 20-gallon gasoline tank weighs about 30 pounds. The gasoline itself weighs 118 pounds. Compressed gas in an amount equal in mileage to 20 gallons of gasoline, would require 24 gas cylinders weighing a total of 3,000 pounds. Metallic

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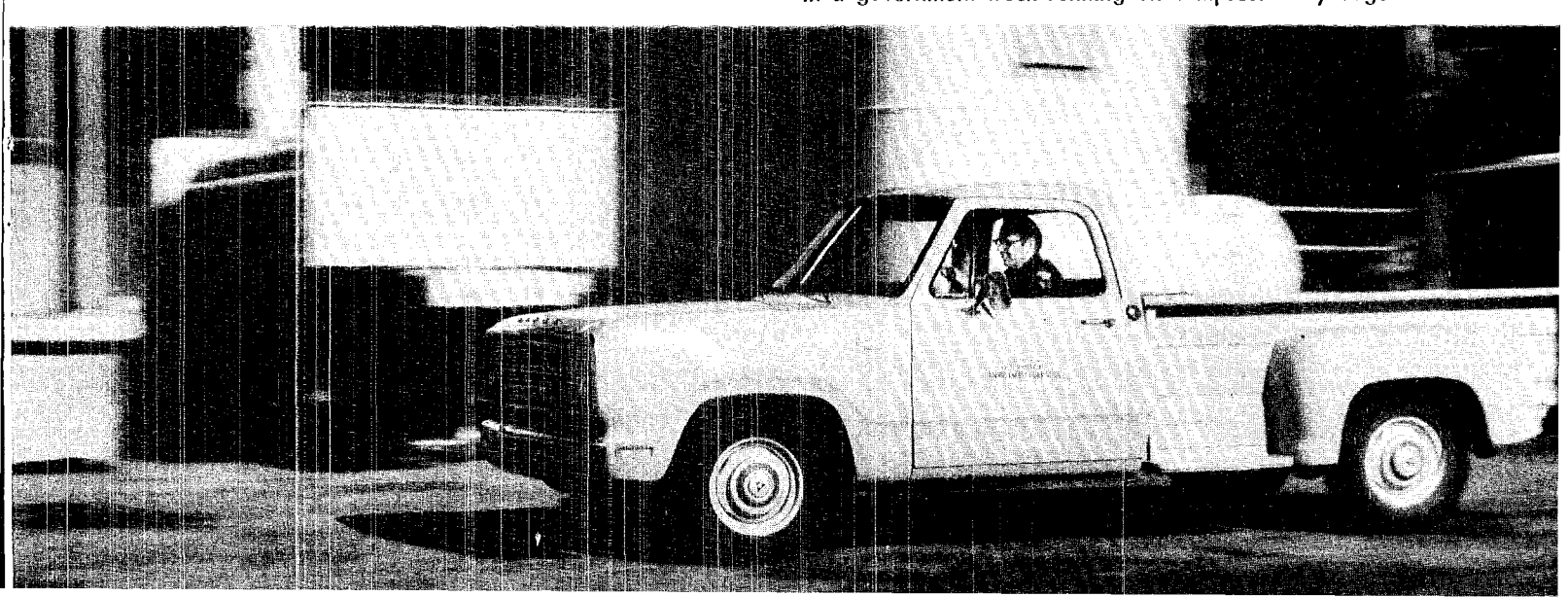
Walter Stewart takes a quick spin around the parking lot in a government truck running on compressed hydrogen.



Frederick Edeskuty, Q-26, holds a monitoring device which withdraws a gas sample from the crankcase to detect the presence of hydrogen. Instruments over the right side of the dash measure temperatures, pressures, and flow rates while those below the center are conventional water temperature and oil pressure gauges.

hydrides are the most promising forms from which hydrogen can be obtained because they generate the gas only as needed and are rechargeable. But hydrides would weigh at least 400 pounds and the tank to contain them an additional 100 pounds.

Liquid hydrogen, on the other hand, can be carried in a 50-gallon dewar weighing about 250 pounds and, in a nearly spherical shape, measuring about 30 inches in diameter. The LASL-designed tank, insulated to maintain hydrogen in its liquid form at 20K or −423°F, is rugged and built to withstand most automobile collisions. With a working pressure of 50 psi, the tank would lose not more than 1 per cent of the fuel per day by boil-off. At this rate, it would be possible to leave an automobile parked for 1 week before the pressure would reach the maximum. It would then be necessary to vent the tank or drive the vehicle to reduce the pressure. The tank could be vented through a catalytic converter in the form of harmless water vapor inside a garage.

The next problem, then, is finding a way to refill the tank. Hydrogen can be handled safely and economically but the personnel involved with it must be highly trained. This difficulty can be overcome, to a large extent, by automation, Edeskuty believes.

"We would hope not every gas station attendant would need a Ph.D.," he said.

Service station fill-up, as Edeskuty envisions it, would be expedited by at least 2 quick-disconnect couplings on the tank. By pushing a button, the attendant would pressurize the gas line to the tank, watching pressure as a function of time to detect leaks. The valves would first be turned to purge position, allowing a purge gas to sweep out all the air, then to fill position for about 5 minutes. The valves would then return automatically to purge position to clear the line, then to shut-off and disconnect. This closed system, allowing no vapors to escape, would eliminate much of the hazard connected with the use of hydrogen.

Although there are some safety problems, Edeskuty and Stewart do not believe they are insurmountable and, in fact, estimate that hydrogen is no more hazardous than gasoline. Comprehensive federal regulations already are in effect for the safe handling of gaseous hydrogen, and automation would provide additional safeguards.

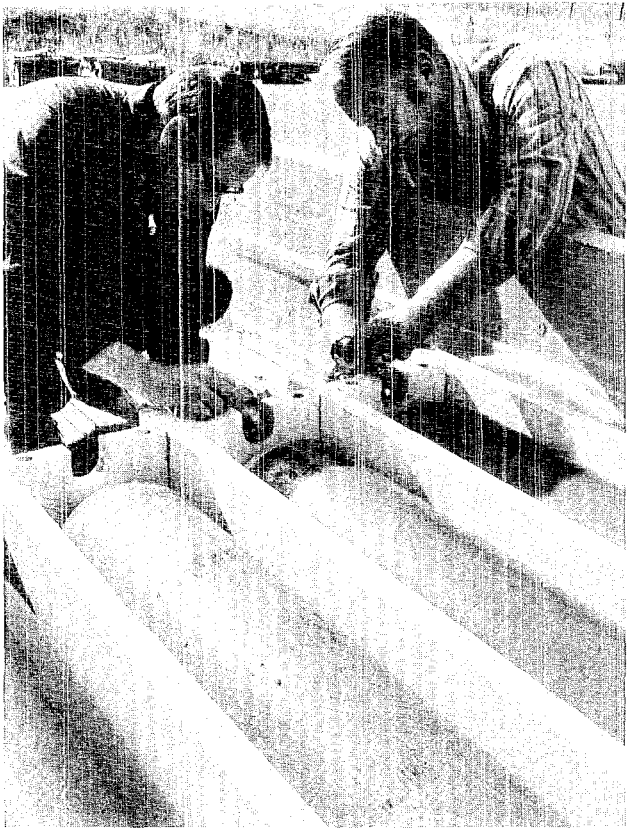
"One of the primary purposes of this work is to show that hydrogen can be safely used for fuel," Edeskuty said.

LASL experiments, begun with the operation of a small lawnmower-type motor, indicate that hydrogen fuel is efficient. Measurements of energy content of the in-going fuel compared with electrical energy going out showed an overall efficiency of 13 per cent for hydrogen compared with 7½ per cent for gasoline.

"This was an 80 per cent increase in efficiency over gasoline but there was a decrease in the overall power of the engine," Edeskuty said.

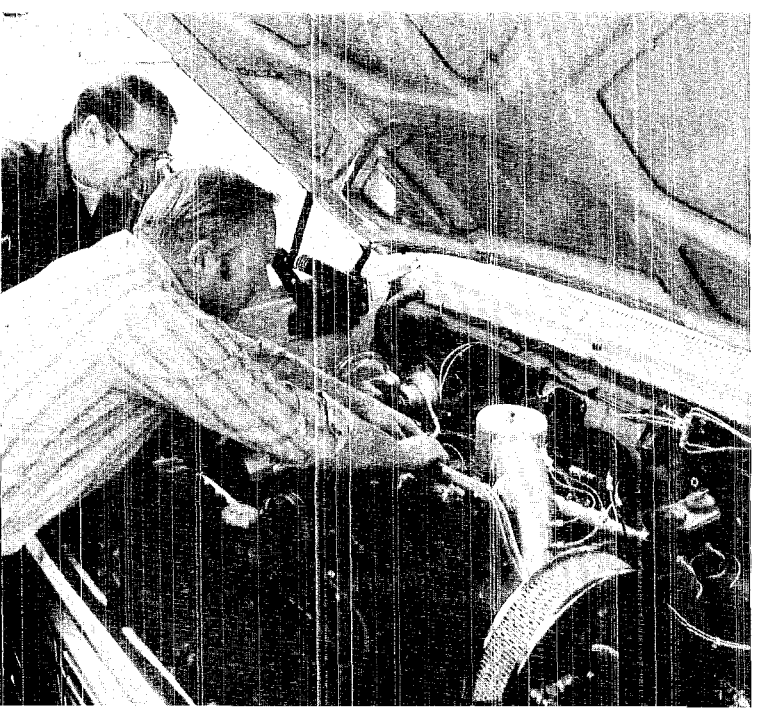
The need for a heat source of about 650 watts to convert liquid hydrogen to the vapor used by the engine is a disadvantage that can be overcome in subsequent experiments. It has been determined that the natural boil-off of 1 per cent would propel an automobile at only 0.1 miles per hour.

It was easy and inexpensive to modify the truck engine. The regular carburetor and air filter were replaced with a propane carburetor donated by a manufacturer. An additional pipe and valve were



Walter Stewart and Robert Candler, Q-26, adjust connections to hydrogen-fueled pickup's supply secured on the vehicle bed. Each of the 4 cylinders contains the energy equivalent of about ½ gallon of gasoline. The truck's supply is presently sufficient for 20-40 miles of driving.

Stewart and Candler inspect a tube connected to the crankcase which ventilates it through the specially built air intake. Tube joins air intake near air cleaner at right. Air enters a gas carburetor through cylindrical cap by Candler's hands.



installed to recirculate about 30 per cent of the exhaust back to the engine to slow down hydrogen combustion. It is hoped that the exhaust ultimately can be used as a heat source for increasing the hydrogen boil-off.

For purely experimental purposes, the scientists modified the distributor so that the spark could be advanced from the inside of the truck and instruments for measuring temperature at 5 points were installed. A hydrogen detector was added to indicate if and when an explosive mixture has accumulated in the crankcase. Installation of some of the instruments and the measurements of exhaust emissions were made by Zia Company technicians.

"Both Zia and industry have been extremely good to us in helping with this work," Edeskuty said.

Enthusiasm for the project prompted the Minnesota Valley Engineering Company to volunteer to manufacture the storage dewar at no cost to the Laboratory and another company contributed a dynamometer test to allow steady state measurements of engine functioning before the truck was converted to hydrogen. "We really need a dynamometer of our own," Edeskuty said. "We thought we could do the job by driving on flat roads but you'd be surprised how few really flat roads there are around here."

Edeskuty and Stewart do not look upon the use of hydrogen as a solution to the country's energy crisis. "It takes a lot of energy to produce hydrogen in the first place," Edeskuty said. "But as an energy transfer medium, hydrogen appears to be the best post-fossil, portable fuel."

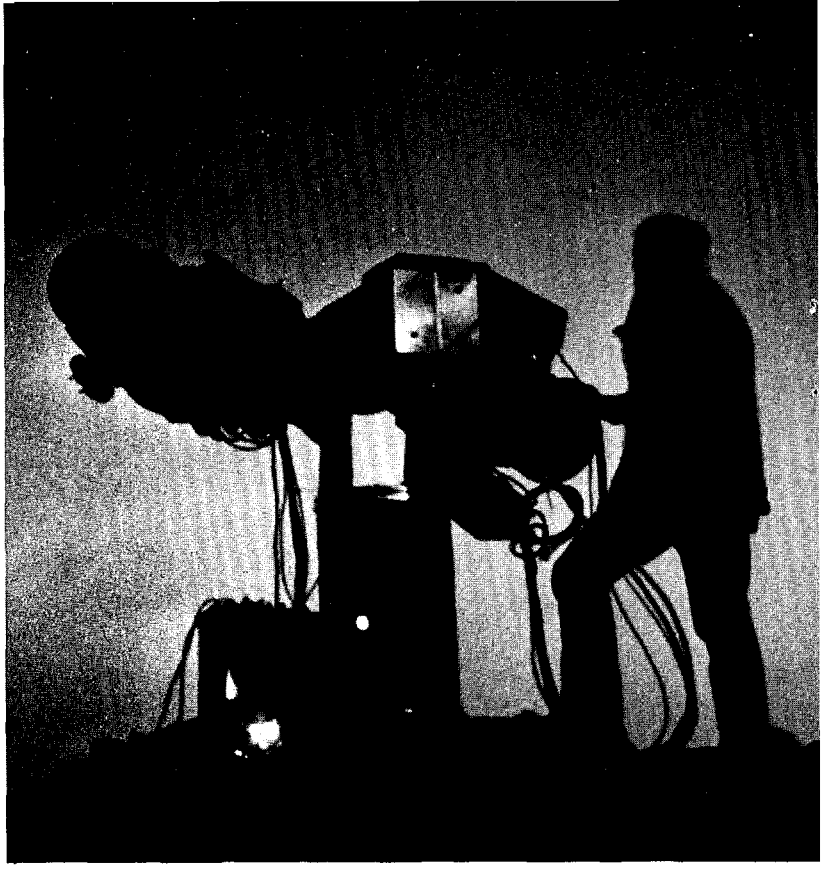
Actually, a crisis in pollution could force the switch to hydrogen before fossil fuels run out because it is almost completely clean. At UCLA, where experiments are being performed on an automobile powered by compressed hydrogen, measurements indicate that hydrogen, when burned with air, produces minute amounts of nitrous oxide but these total only one-half of the 1976 standards for the contaminant. Burning liquid oxygen with hydrogen would totally eliminate the pollution but would compound the storage-refill problem.

Hydrogen-propelled automobiles are not new. Experiments with various forms have been undertaken since about 1930. However, Edeskuty said, "We feel we can make a contribution by showing that the use of liquid hydrogen is feasible and learning a great deal about the process while we're doing it."

Skylab, LASL linked in

Barium Tracer Experiment

Editor's Note: **A successful injection of barium ions along magnetic field lines took place on the first scheduled launch date, November 27. Skylab's astronauts observed the payload detonation and the ion stream for about 4 minutes. Other stations recorded data for nearly 30 minutes. A second rocket launch was pending at press time, as observers waited for favorable weather.**



Silhouetted against a starlit Hawaiian sky, Brook Sandford, J-10, prepared to track the barium ion streak with an intensified-image orthicon camera atop Mt. Haleakala on Maui. Photographs on these 2 pages were made during the 1972 barium experiment.

Skylab's third and last crew of astronauts, now in orbit and embarked on a full program of scientific research, was scheduled to assist the Los Alamos Scientific Laboratory and the University of Alaska Geophysical Institute in an experiment to trace geomagnetic field lines with barium ions.

A National Aeronautics and Space Administration Black Brant IV rocket, to be launched from the Poker Flat Range near Fairbanks, Alaska, between November 27 and December 8, carries a payload designed to create a high-explosive-driven jet of barium vapor to be injected into the earth's magnetosphere. It is hoped that the barium, ionized by solar ultraviolet radiation, will illuminate geomagnetic field lines and make them visible to sensitive optical equipment for many thousands of kilometers.

The payload is precisely pointed by an attitude control system so that the explosive force directs the barium ions upward along magnetic field lines. The ions are attracted to the field lines and, in a complicated spiraling motion, follow them up and over the equatorial high point. Under optimum conditions it should be possible for scientists using sensitive optical equipment to trace the path of the ion stream out to an altitude of 35,000 kilometers (about 22,000 miles) at the equator. It may even be possible to record the streak on its way back down into the atmosphere at the conjugate point south of New Zealand, a distance of about 100,000 kilometers (about 62,000 miles).

A space physics research team from LASL, the University of Alaska, and Sandia Laboratories of Albuquerque will man observation posts on the ground in Alaska and the Hawaiian Islands and in the air aboard an Atomic Energy Commission/Air Force NC-135 jet aircraft. Paul Bottoms, J-10, is the principal scientist aboard the aircraft. At Mt. Haleakala, Maui, Hawaii, Brook Sandford, J-10, is in charge of the LASL optical station. Rocket operations advisors at the Poker Flat Range are John Conrad, J-9, and Bill Roach, J-10. Jim Wells, J-1 associate group leader, is principal operations officer at the scientific command post in Honolulu. Other LASL participants are Rubel Martinez, Walt Gould, and Ken Green, all J-10; and Miles Hindman, J-8.

The Skylab astronauts, in the blackness of space, should be able to observe the dim, barium ion streak about 10 times better than ground observers because of their position above the atmosphere. With fast lenses and sensitive film they could possibly contribute invaluable information that will complement other data by providing another viewpoint, particularly if the ion stream does not behave as predicted.

Because weather conditions permitting successful optical observations from prime ground stations must coincide with one of 7 favorable Skylab passes over the Pacific Ocean region where the astronauts can see the ion stream, dates for the launch are crucial. A 20-kilogram (about 44 pound) high-explosive shaped-charge surrounding a 1.3-kilogram (about 2.9 pound) cone of barium metal will be fired at an altitude of about 561 kilometers (about 348 miles).

Milt Peek, J-10 group leader, and Eugene Wescott, University of Alaska Geophysical Institute, are the chief scientific investigators for the magnetic field line studies. Peek will coordinate operations from a scientific command post in Honolulu, Hawaii. Wescott will be at the Ester Dome Observatory in Alaska. NASA scientist-astronaut Don Lind will help to coordinate the experiment at the Johnson Spacecraft Center at Houston.

The Sandia Laboratories Upper Atmospheric Projects group directed by John Eckhart will provide telemetry, assemble the payload, and have personnel at Poker Flat as well as aboard the NC-135 aircraft.

The principal objectives of the experiment are: to determine the geomagnetic field line configuration along as much as possible of its entire length from the injection point in the northern hemisphere to its magnetic conjugate, or corresponding point in the southern hemisphere, nearly 1,300 kilometers (about 800 miles) south of New Zealand's South Island; to study the effects of plasma conductivity and geomagnetic activity upon the motion of the barium plasma along field lines; and to determine the feasibility of space observation of a low-level light source produced by a cold metal plasma after its injection into the earth's magnetic field.

The earth's magnetic field surrounds our planet with an invisible barrier diverting dangerous energetic solar and cosmic charged particles which, if allowed to impinge on the earth's surface, could be lethal to life as we know it. Evidence is accumulating that the magnetic field variations affect man in other ways, such as weather patterns and disturbed communications, and can have a direct effect on man's psychological attitude.

Satellites have made the study of our magnetic field in space possible and by measuring field strengths over a period of time have produced a general picture of the magnetosphere and its dynamics. However, to directly observe changes in the field it is necessary to illuminate field lines and observe their motions.

Previous experiments in 1971 and 1972 by the LASL/University of Alaska group demonstrated that this technique of using a directed barium ion stream does illuminate field lines and makes it possible to trace them for considerable distances. The experiment is analogous to using iron filings sprinkled on a sheet of paper over a magnet to show the magnet's field lines.

Tuned in to LASL outposts via communication satellite radio, operations officer Jim Wells, J-1 associate group leader, waits out the countdown for the rocket launch.

Milt Peek, J-10 group leader, and Eugene Wescott, University of Alaska Geophysical Institute, chief scientific investigators for the barium project, study data pictures of magnetic field-line tracings.

Observers watch as the molten earth is pushed out the end of a shell holding alluvium. This was a demonstration of the horizontal consolidator.

Burning-Through-the-Earth Demonstration Intrigues Washington, D.C., Audience

In prehistoric time, early man realized his work could be simplified with the use of tools.

And one of the first tools was undoubtedly a stick or bone for digging.

With only relatively simple modifications, the art of digging or drilling has not changed much since those times. Better drill bits, the use of rotary drills, and other similar improvements have contributed to the drilling art. But punching, chipping, grinding, blasting, or shoveling holes in the earth have thus far been the primary methods used.

However, a new boring tool that was designed and built by scientists from the Los Alamos Scientific Laboratory—and called the subterrene—was successfully demonstrated before several groups in Washington, D.C., in mid-October.

The demonstrations were held October 11 and 12 at the U.S. Army's Engineering Proving Grounds quarry area at Fort Belvoir near Springfield, Virginia. Among the estimated 300 persons who attended one of the 4 scheduled demonstrations were representatives from Congress, U.S. Government agencies, the news media, equipment manufacturers, and excavation firms.

John Rowley, Q-23 group leader, and Joe Neudecker, also Q-23, conducted the demonstrations and were assisted by Mike Callaway, Ed Griggs, Larry Hupke, Richard "Red" Renfro, Darrell Sims, and Ed Williams, all of Q-23.

The major difference in the subterrene is that it melts holes in earth and rock instead of drilling by conventional methods.

The demonstrations began with brief summaries by either Rowley or Neudecker on the history of the subterrene, the ways it differs from conventional methods, and the possible future practical applications.

Then, each of the two portable subterrene units was demonstrated for the observers.

The first was the horizontal consolidator. The 50mm penetrator (about 2 inches in diameter) was heated to approximately 1,600°C. (The 3 kilowatt electrical heat source is equivalent to 3 household irons.) After reaching the desired temperature the penetrator was allowed to heat through a foot-long section of alluvium encased in a steel shell. As the consolidator moved horizontally through the alluvium, the surrounding material was melted. This melt then froze to a hard, obsidian-like glass lining on the wall of the hole, and no debris was removed from the hole.

The consolidator, which moved at the rate of approximately 20 feet per hour, broke through the end of the sample which enabled the observers to watch as the molten earth was pushed out the end of the shell and the hot, glowing penetrator was visible.

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After this demonstration the shell was removed and the observers were allowed to examine the glass casing formed by the penetrator. Another shell with alluvium was placed in position and those who wished could watch the horizontal penetrator once again melt through the soil from a vantage point of only a few feet.

After the horizontal consolidator was demonstrated, the extruding penetrator was operated in a vertical position.

This showed the capability of the subterrene concept in rock too dense to permit all the molten material to consolidate or flow into cracks and voids in the rock. In this demonstration, part of the rock melt is forced upward and outward, and when cooled forms the hard glass-like lining of the hole. Most of the melt, however, is pushed up through the central hole in the penetrator into what is called the "extrusion zone." In the upper part of this zone, the melt is cooled and solidified. The extruded solid debris, which many say resembles black popcorn, is then carried to the surface by the flow of the coolant.

This debris was collected in a box and after the demonstration the observers were free to handle it and take some with them as samples.

At the conclusion of the formal demonstration, which took about 30 minutes, the observers were invited to examine the subterrene penetrators at close range and ask questions of the LASL demonstration team.

Among the questions was one by a reporter for the *Washington Star-News* who asked how the subterrene was invented. Rowley replied:

"We had been testing the ability of (nuclear) reactor parts to withstand high temperatures and had an electrically heated simulated fuel element under a bell jar when it came time to take a coffee break. Someone wondered idly if that heating element might be capable of melting rocks. Son of a gun if it didn't melt them like crazy."

Rowley was referring to the early 1960's when LASL was heavily engaged in Project Rover.

John Rowley, Q-23 group leader who headed the Laboratory's demonstration team, shows a casing sample to Maj. Gen. Frank Camm, AEC assistant general manager for military application, and James Coleman, formerly with LASL and now with the AEC's Division of Physical Research.

New Mexico's U.S. Senator Pete Domenici questions 2 members of LASL's demonstration team, Richard "Red" Renfro and Larry Hupke, both Q-23.

Several questioners were also curious as to the advantages of the subterrene over conventional drilling methods.

In situations where rotary drills are normally used, two advantages of the subterrene are simplicity of operation and longer bit life. According to Rowley, the three major facets of excavation—rock fracturing, debris removal, and wall stabilization—are accomplished in a single integrated process by using a subterrene. The working life of a penetrator is about 1,000 hours which is much longer than the life of a rotary bit under normal operation.

As can readily be seen, if the penetrator can advance at the normal rate of 20 feet per hour—which is believed to be an attainable rate—then a hole 20,000 feet deep could be drilled without the necessity of changing bits.

Many of the observers with experience in deep drilling, especially in the oil fields, noted that a great amount of time in a deep drilling

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operation is spent in pulling sections of the drill pipe to change bits. The long bit life will therefore save time and money. Simplicity of equipment on the surface and the potential for automation were also noted.

Another subterrene advantage, Rowley and other members of the LASL team noted, is its ability to make holes of precise diameter. This is a very useful characteristic in boring holes for anchoring structures such as bridges, television towers, and transmission line towers. Emplacement holes for anchoring pipeline supports could be readily bored in difficult materials, such as Alaskan permafrost. Loose gravel and other unconsolidated formations are difficult to drill with conventional rotary equipment. The subterrene, which would leave a glass-lined hole, provides a solution to this difficulty.

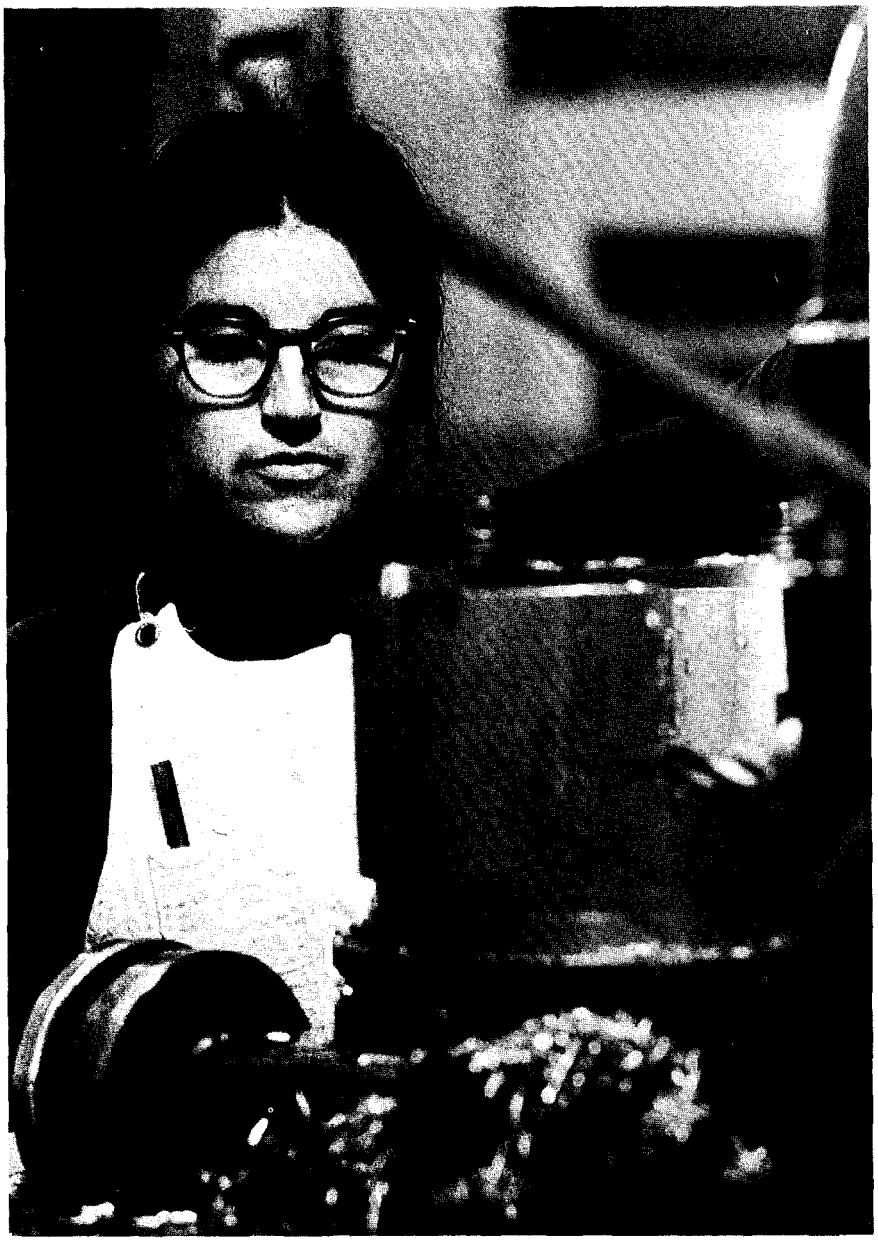
Holes can be drilled both vertically and horizontally of any configuration—square, elliptical or other shape—since the hot penetrator does not rotate. The holes can be formed with extreme precision and can be made perfectly straight or with bends or curves if this is desired. This capability will be very useful in exploration of potential geothermal energy sites.

The guests were also told that although the penetrators that have been made and tested so far have fairly small diameters, theoretical studies and laboratory experiments suggest that subterrenes can be used for boring much larger diameter holes. Plans are being made to build larger experimental penetrators.

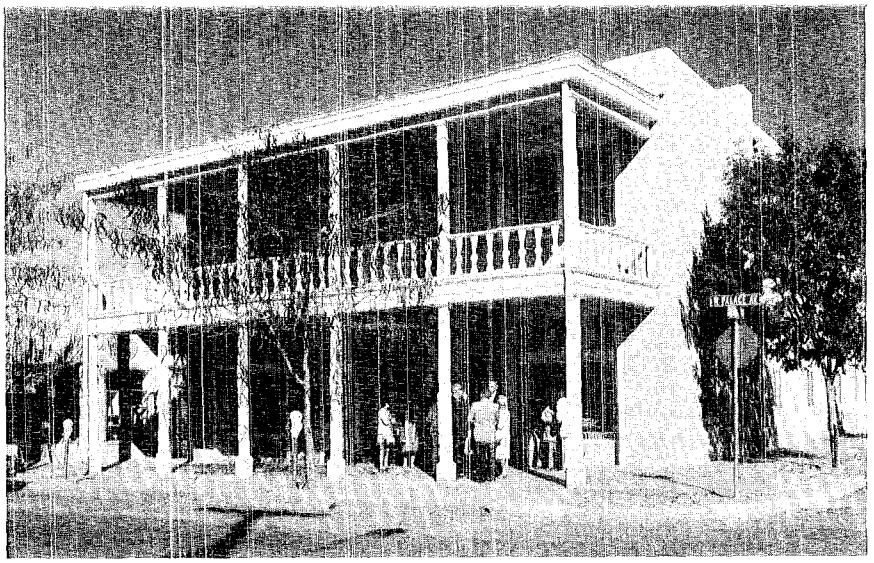
In addition to examining the penetrators, associated equipment, and the melted holes at close range, the observers were invited to visit a nearby trailer which contained posters, hardware, samples, and literature on the subterrene program.

The subterrene project is currently funded in part through the National Science Foundation's Research Applied to National Needs program.

Photo Shorts



Grace Gutierrez, working here at a horizontal milling machine, has become the first woman to participate in LASL's 5-year machinist apprenticeship program. Grace has worked for the Laboratory since 1969 and joined the program in September after 4 years as a secretary in SD-1. One of 30 apprentices now participating in the state-certified program, Grace will work in various shops learning a variety of skills, then in inspection and maintenance, and finally in the advanced tool and gauge shop before becoming a journeyman. "It's fun and it's different," says Grace, whose only previous mechanical experience has involved minor repairs on her car.



A plaque commemorating the first headquarters of the military men and women who came to Los Alamos as part of the Manhattan Project was unveiled last month at the Bishop Building, 123 W. Palace Avenue in Santa Fe. Mrs. Carl Bishop erected the plaque in honor of her late husband who owned the building at the time it was occupied by the Army from 1943 to 1947. Master of ceremonies for the event was Robert Porton, ISD-2 group leader, who had passed through the building as a sergeant on his way to Los Alamos during the war.

Calibration of instruments for measuring fissionable material is undertaken by participants in LASL's recent nondestructive assay training program. Below, left to right, are Sylvester Suda, Brookhaven National Laboratory; Tom Atwell and Dick Siebelist, both A-1; Al Martello, Albuquerque; and Edward Clay, Atlanta, Georgia. The program, directed by Doug Reilly and Ron Augustson of A-1, was conducted for AEC contractors and licensees involved in the measurement and inventory of fissionable material. A-1 has pioneered in development of assay instruments.

Murray Gell-Mann, winner of the Nobel prize for physics in 1969, discussed quarks, the hypothetical subatomic particles he first postulated, at a Laboratory colloquium recently. He also consulted with T-Division staff members during his 4-day visit. A professor of theoretical physics at the California Institute of Technology, Gell-Mann is a member of the President's Science Advisory Commission.

short subjects

A LASL documentary film, "The First 25 Years," is the recent recipient of 2 national awards for excellence. The 1973 INDY award was presented by the 15th annual Industrial Photography Film Festival for "outstanding achievement in industrial motion picture production." A Chris award for educational films on significant social events was presented by the Columbus (Ohio) Film Festival sponsored by the Greater Columbus Film Council.

"The First 25 Years," written and directed by **Mario Balibrera,** ISD-7, features former LASL Director **Norris Bradbury** describing the early years of the Manhattan Project at Los Alamos. **Billy Claybrook** and **Rob Gordon,** ISD-7, and **Bob Harper,** former LASL photographer, were the cameramen.

Another LASL film, "Computer Color Generations," also produced by the ISD-7 motion picture section, has earned a Golden Eagle, highest award of CINE (Council on International Non-Theatrical Events) and will be among 18 films selected to represent the United States at international film events.

A more surprising honor was the inclusion of "Computer Color Generations" among the finalists in the 11th International Science Fiction Film Festival in Trieste, Italy, in July.

Alphon Ellison, SD-1, a Laboratory employee since 1959, died October 7. He is survived by his wife, Charlotte, and 4 children, Barbara, Cheryl, John, and Robert.

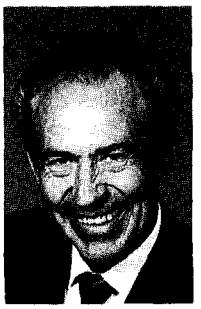
Jerome Rosenthal, CMB-6, died November 7. He is survived by his wife, Mary Ann, H-1, and 3 sons, Mark, Scott, and Paul. Rosenthal had been employed by the Laboratory as a ceramic engineer since 1966.

Byron Thompson, T-3 staff member, died October 29. He is survived by his wife, Lynnda, and 2 children, Byron Jr., and Marilynn. Thompson had been employed by the Laboratory since 1964.

A Congressional Certificate of Merit has been presented by Congressman **Manuel Lujan, Jr.,** to LASL's Critical Assembly Group, P-5, in recognition of the group's outstanding safety record of 25 years without a disabling injury. "As a member of the Joint Committee on Atomic Energy, I feel that a safety record such as the one made by those employees deserves something more than just congratulations," Lujan said in a letter to Deputy Director **Raemer Schreiber.**

Koonce

Lathrop



Winburn

Andrew Koonce, ADWP, has been promoted to the rank of colonel in the United States Air Force Reserve. A Laboratory staff member since 1954, Koonce served in the Army Air Corps from 1942 to 1946 and in the Air Force from 1951 to 1954. He has been a member of the Air Force Reserve since 1954.

Kaye Lathrop, T-1 group leader, has been appointed to the Atomic Energy Commission's Advisory Committee on Reactor Physics.

The committee provides advice and consultation on a wide range of physics problems to support the planning and conduct of AEC programs in reactor physics.

Lathrop has been a LASL employee since July, 1962.

D. C. Winburn, L-DO, has been elected to the board of directors of the Laser Institute of America. According to Burton Bernard, president of LIA, his election to the board by colleagues "is recognition and verification of your dedication and contribution to the laser community." Winburn, L-Division safety officer, has also been appointed to the American National Standards Institute Subcommittee on Control Measures of the Z136 Standard Committee on Safe Use of Lasers.

EARTHQUAKES

Lab network finds where the action is

Shortly after midnight last March 17 the earth rumbled, dishes rattled in their cupboards, and all over Los Alamos a sleeping population was awakened. It was an earthquake, rarely felt on the Hill, and it reached a magnitude of 4 on the local Richter scale*.

But how unusual was it? Have there been others? Will there be more? Where do the faults lie?

Information of this kind is being sought in a seismic program recently undertaken by the Los Alamos Scientific Laboratory as a coordinated effort of J-9, underground test phenomenology; with H-8, environmental studies; and ENG-7, design analysis.

"To begin with, we have to record ground motion 7 days a week, 24 hours a day, to get as much data on local activity as we can," said Ken Olsen, alternate J-9 group leader in charge of the seismic work.

To do this, J-9 is setting up a network of seismic stations surrounding the Los Alamos area which record ground motion down to magnitude 2 and lower, and feed the data by radio or telephone into seismograph recorders in the LASL Administration Building. There the data is reduced and computer analyzed by John Stewart, assisted by Norma McFarland, and plotted and mapped by Secundio Sandoval. The resulting information not only indicates the amount of activity, but also pinpoints its location and allows identification of fracture systems that are presently active in the area.

The long-term project is designed primarily to provide material for environmental and safety analysis for the Laboratory's forthcoming geothermal experiments by Q-22, and to aid engineering and safety studies for Laboratory construction. The information also will be of value in determining means of discriminating between natural and man-made vibrations for detection of underground nuclear explosions, should a more comprehensive nuclear test ban be put into effect.

Information recorded by the LASL network will be incorporated in long-term data for the state of New Mexico.

"We are pretty far behind in tabulating earthquake activity in

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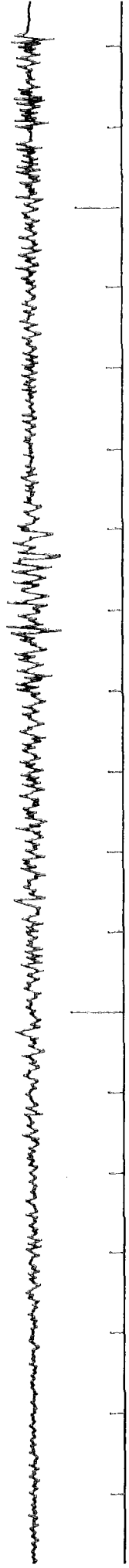
*Local Richter scale is derived by computing the amplitude of ground motion from measurements on the seismogram and applying a correction for the distance between the station and the quake.



Seismogram tracing shows the second aftershock of the March 17 quake as it was recorded at J-9's temporary station in Barley Canyon at about 1:27 a.m. This shock reached a magnitude of about 1.5 on the Richter scale.

New Mexico," Olsen said, pointing out that the state had no seismic stations at all until 1960 when Allan Sanford of the New Mexico Institute of Mining and Technology installed one in Socorro. Since then stations have been added at Las Cruces and Albuquerque and other installations in El Paso, Texas, and Trinidad, Colorado, help monitor the state. "But coverage of New Mexico has not been as good as many other parts of the nation," Olsen said.

In the past the Laboratory has had to rely on the very limited amount of instrumental data, supplemented with historical and geological information, to estimate seismic risk before undertaking construction of new facilities. It is the responsibility of H-8 and ENG-7 to evaluate such data, which will now be improved and updated by that generated by the J-9 network, to establish criteria for new construction and for estimating the earthquake resistance of existing structures.

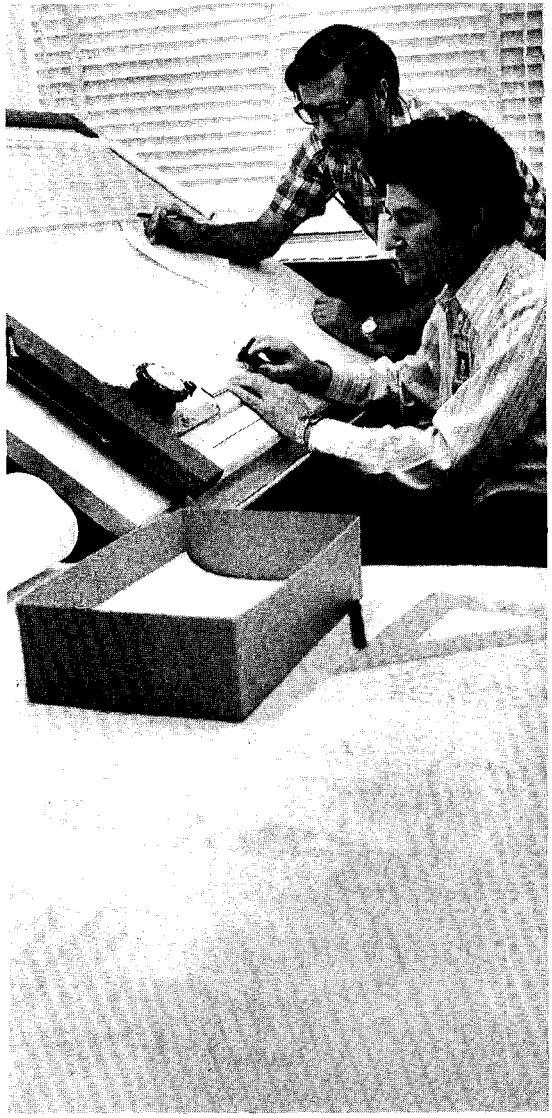
In January, 1972, LASL installed the first of its 6 seismic stations at the former TA-49 site on Frijoles Mesa north of State Road 4. Others have been located in an underground concrete bunker at TA-33 site near Bandelier; near a geothermal test drill hole at La Cueva where a leased telephone line delivers the data; and at St. Peter's Dome where a radio telemetry station is maintained.

This fairly tight cluster has recently been expanded to include installations at the Forest Service Lookout atop Clara Peak above Santa Clara Canyon and on Tesuque Peak in the Sangre de Cristos where radio telemetry facilities were already available. The circle of stations, which J-9 will continue to widen, makes possible the location of earthquake epicenters by triangulation.

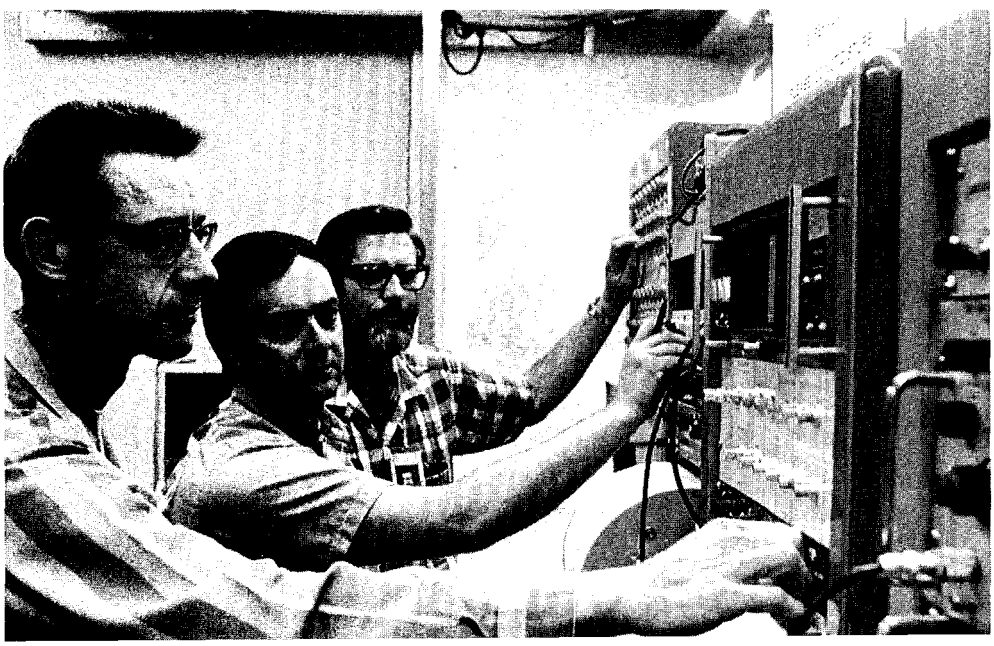
Choice of sites for the stations, which include a seismometer, amplifier, and transmitter, depends primarily on the suitability of the geological formation and availability of power and telephone lines. However, a few remote stations can transmit data from a battery-operated, modified walkie-talkie to an antenna atop the Administration Building.

Hard bedrock is required as a base for the more sensitive seismometers. "The soft tuff so prevalent in this area builds up an extremely high level of background noise from 'cultural events'," Olsen said. Cultural events are man-made activities, such as traffic, which cause ground vibrations.

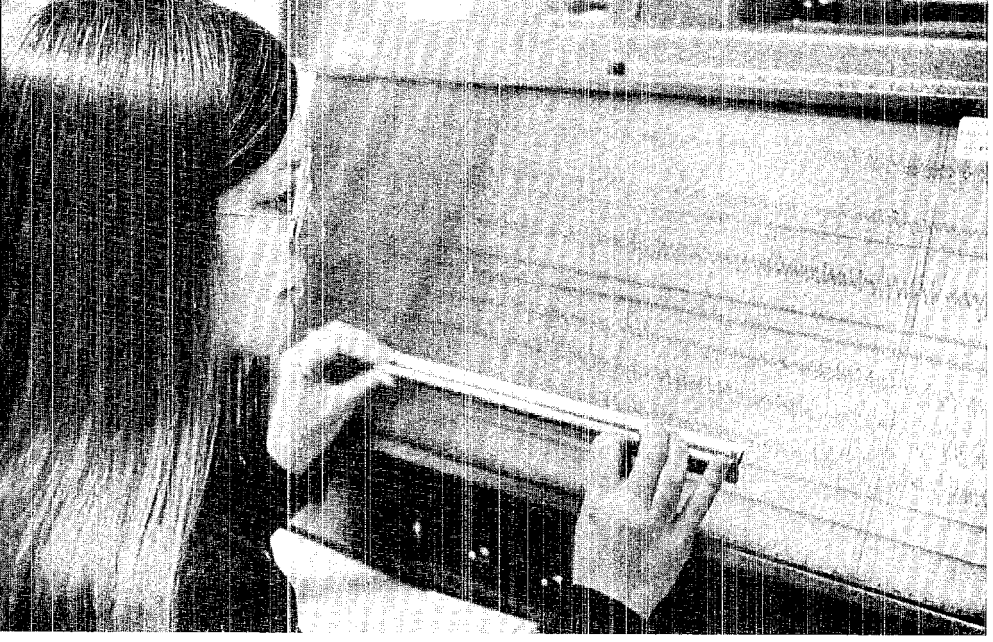
In the event of a strong earthquake which would throw the more sensitive monitors off scale, J-9 supplements its low-level network with a strong-motion seismometer, located in the Administration Building basement, which is automatically triggered when a certain acceleration level is exceeded. The strong-motion records are of particular interest to the Engineering



On a Los Alamos map, Secundino Sandoval plots intensities of the March 17 earthquake as determined from impressions of local residents. Ken Olsen checks one of 1,500 questionnaires returned to J-9 in response to its survey.



John Stewart, Dave Yates and Ken Olsen give instruments in J-9's recording room a daily check. Rotating drum recorders take data from stations in the seismic network to provide quick-scan capabilities. Film-recorded data from these and other stations permit more detailed examination.



Norma McFarland studies film record of a seismic event to determine arrival time of the shock. Vertical lines mark off 10-second intervals.

Department in developing structural design criteria.

Installation of the seismic network has been the responsibility of Charles Anderson, J-9 electrical engineer, who designs the equipment. E-3 provides help for radio transmission electronics. J-9's Dave Yates is the electronic design technician who keeps all station equipment in working order.

In the spring, when Q-22 expects to begin geothermal experiments in the Jemez Mountains, J-9 will install additional seismic stations near the drilling sites.

The geothermal experiments are designed to determine if energy can be extracted from hot, but dry rock by forcing pressurized water down a hole to create a large underground fracture system and then circulating surface water down the hole and up through another. A heat exchanger at the surface would convert heat from the water to energy.

"There is some question that the initial hydraulic fracturing and thermal stress cracking might cause small, artificial earthquakes," Olsen said, "although portable monitoring equipment detected no such events for the small-scale experiments that were conducted last winter."

Olsen said plans call for specially designed, high-frequency seismometers to be installed both at the surface and at the bottom of the holes to see if the orientation and size of the fracturing could be determined from seismic data.

The network also will be of value in monitoring possible earth motion resulting from the filling of Cochiti Dam.

"There is evidence that pressure created by the impoundment of large amounts of water can cause rock failure and increased seismic activity," Olsen said. "This happened when Lake Mead was formed behind Hoover Dam."

In addition to recent instrumental data, seismologists must rely on geological and historical information in estimating seismic risk.

Geological evidence indicates that the center of greatest risk in New Mexico lies in the Rio Grande Rift, a series of faulted depressions extending through central New Mexico from the Colorado border to Mexico. The rift was formed about 20 million years ago during the most recent period of adjustment in the earth's crust. The continued activity along the rift indicates that these adjustments are still taking place.

"In Northern New Mexico there's about one earthquake a year perceptible to people," Olsen said, "and most of them have been close to the rift area."

It was a fault along the western edge of the rift that provided a vent for the volcanic activity which formed the Jemez Mountains and the Valles Caldera of which the Valle Grande is a part. The largest fault in the Los Alamos area, extending north and south along West Jemez Road to the west gate, separates the mountains from the plateau.

Some seismologists estimate that in Los Alamos there should be only one earthquake of magnitude 6 every 8,270 years or one magnitude 5 shock every 100 years. This compares with the expectation of one shock 6 jolt per 100 years in the Socorro area where activity in the Rio Grande Rift is the greatest. However, seismic risk in New Mexico is considerably lower than in California (1/18 the risk of the Los Angeles Basin, for example), but higher than other areas such as the midwest.

Historical seismic data for New Mexico, which goes back only to 1849, indicates the state's largest earthquakes have occurred in the southern portion of the Rio Grande Rift. A series of shocks, occurring almost daily in the Socorro area from mid-1906 into 1907, included New Mexico's largest recorded jolt, an intensity 8 quake on July 16, 1906. Another quake

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Drilling an emplacement hole for a seismic station at La Cueva is Linda Trocki, a student at New Mexico Institute of Mining and Technology who works with H-8 on a 6-month cooperative plan. Bill Purtymun, H-8, and Charles Anderson, J-9, help prepare the hole where a seismometer will go.

Photos by Charles Anderson, Dave Yates and Carl Keller.

High atop Clara Peak, Carl Keller and Charles Anderson, J-9, prepare a hole in which the seismometer shown at right will be placed. Instrument is set on a concrete pad before being buried.

rocked Cerrillos in May, 1918, with an intensity 7 to 8.

The intensity scale, unlike the instrument-measured Richter magnitude scale, is derived from historical data and includes the impressions of individuals and evidence of damage. The scale ranges from intensity 1, felt by almost no one, through intensity 8 in which there is substantial building damage, to intensity 12 where damage is total and ground surface distortion is visible.

On August 17, 1952, Los Alamos was the center of an intensity 5 earthquake in which some walls were damaged and doors and dishes rattled.

Because of the significance of this kind of historical information in understanding seismic phenomena, an important part of the seismic section's job during the past year has been tabulating and plotting impressions of the spring earthquake as reported by Los Alamos residents.

Replies from more than 1500 people, responding to a questionnaire distributed in the LASL *Bulletin* on March 23, indicate that the tremor was felt most strongly in the North Community in intensities between 3 and 5. It was generally characterized by a loud noise, similar to an explosion, and a sharp jolt. The variety of reported effects ranged from rattling dishes and sliding lamps to an hysterical parakeet. Instrumental data has located the epicenter of the quake in the mountains about 4 miles southeast of Abiquiu and 20 miles north of Los Alamos.

Meanwhile, anyone who feels uncertain about his safety needs only to venture into Rendija Canyon where a group of tall pillars of conglomerate have precariously balanced massive rocks on their narrow tapered peaks for centuries. These pedestal rocks, according to A. J. Budding, professor of geology at NMIMT, are a strong indication that the Los Alamos area is not where the major action is.

These are the days we'll all remember
Each day will be a glowing ember.
So adios until September
To our El Rancho Grande Ojo.

Los Alamos Ranch School song
sung to the tune of "El Rancho Grande"

Ranch School alumni take a

Sentimental Journey

They all had said their final "adios" to the Los Alamos Ranch School many years before, but the memories came rushing back to some 50 alumni who returned this fall with their wives to the scene of their unique prep school years.

Between 1918 and 1942 they had come to the school from all over the United States for a tough, well-rounded, and expensive education. In addition to thorough instruction in all aspects of outdoor life, they received academic training of such quality that "there wasn't a college or university in the country that wouldn't automatically accept us."

Wearing khaki shorts, they had done calisthenics in the snow, cut trails on horseback, worked the fields, maintained the roads, and studied on the lonely Pajarito Plateau. "We did everything hard and we did everything well," said one graduate. "These were the best years of our lives."

Now they were back, many of them for the first time since their school days, and what they found surprised them. They had expected growth and change, but they seemed delighted to find so much remaining from the past.

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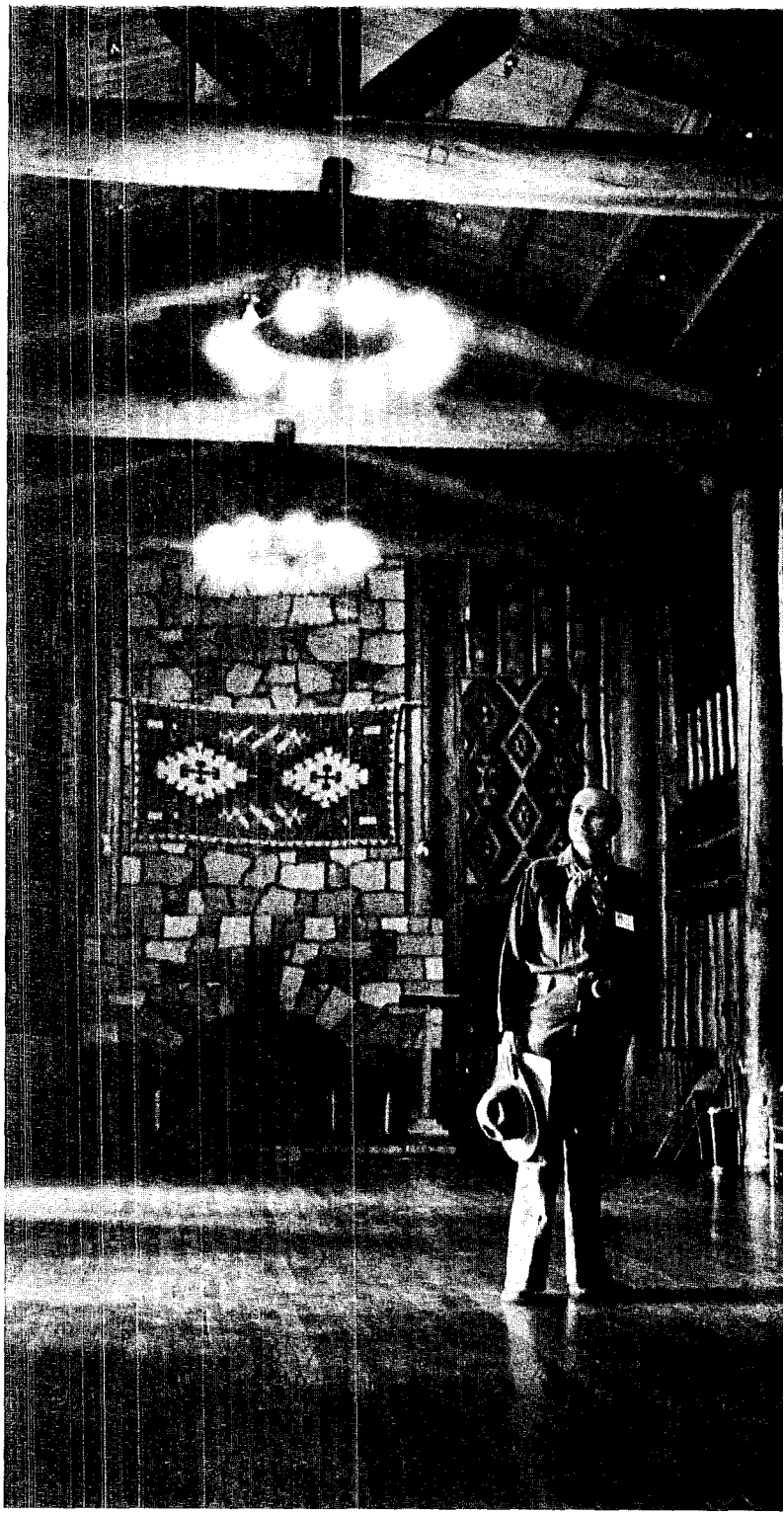

Echoes of another era surround Los Alamos Ranch School alumnus Baird Tenney in the emptiness of the once bustling dining room at Fuller Lodge.

Former academic headmaster Lawrence Hitchcock of Rockville, Maryland, showed former student Peter Wainwright of Scottsdale, Arizona, where he had run a special converter to his room to provide AC-DC current for his radio when the school had only direct current. Both men are wearing their original school uniforms.

The school nurse's quarters on the third floor of Fuller Lodge were found unchanged by Douglas Campbell, president of Argyle Research Corporation of New York, and Joseph Ryan, juvenile court judge of Albuquerque. Later known as the Throne Room, the quarters were reserved for Gen. Leslie M. Groves, director of the Manhattan Project during the war years.

They roamed through Fuller Lodge where they had eaten their meals and held dances with the Brownmoore School for Girls in Santa Fe. Headmaster Lawrence Hitchcock, visiting from Maryland, found his old quarters on the Lodge third floor and showed his former students the secret bar he had shared with the faculty.

They visited Spruce Cottage, once living quarters for seniors and now the home of the James Lilienthals, and the Arts and Crafts Building, now occupied by the Raemer Schreibers.

"Those people are just wonderful the way they let us wander through their homes and see all those old pictures they've kept," commented Mrs. Robert Stuart whose husband is now president of Quaker Oats. "They really care about history."

They browsed through the Los Alamos Historical Museum and shared reminiscences with members of the Historical Society. At noon the school bell, still atop the Lodge, tolled once more as it had rung for mealtimes so many years before.

"They told us there wouldn't be anything left of the place," marvelled one wife at the end of a nostalgic day.

Excitement began to mount as the busloads of former students approached the Rio Grande from Santa Fe where they had arrived by a special 8-car train arranged for by alumnus John Reed, chairman and chief executive of the Santa Fe Railroad.

"By golly, that old bridge is still there!" somebody exclaimed, pointing out the original Otowi crossing. From the cushioned comfort of the sight-

seeing bus, they spotted remnants of the breath-taking switchbacks they had once climbed on horseback through Culebra Canyon. Maintenance of the road had been the responsibility of the school and hence its students, who recalled the work they had done to keep it in shape.

Ashley Pond was a shock. So was the Los Alamos Canyon bridge. "It used to be a half-day's ride down into that canyon and back up to the other mesa," an alumnus recalled.

Confined in its concrete circle and neatly landscaped, Ashley Pond was barely recognizable to the boys who had once fished, canoed, and skated on it.

"During the winter we could skate or play hockey there after about 4 o'clock when it began to get colder" one man said. "Most of the time the ice wasn't hard enough." Eventually the boys were to build a new rink in Los Alamos Canyon; in 1973 the alumni were pleased to know the rink was still there.

"We had a lot of trouble keeping Ashley Pond full. It was continually draining," a former student recalled.

"Remember when we decided Ashley Pond was a direct outlet to the Gulf of Mexico?" asked one of the younger men. "When the military came in we were sure they were going to build submarines in here and send them out through the pond."

Actually, the boys at the school in 1942 had made some pretty good guesses about why the War Department was taking over the facility for the Manhattan Project. Peter Wainwright, who was still on "the Hill" six weeks after the Army arrived, told the story:

"About October that year we had seen a couple of men wandering around dressed as Army officers. One of the fellows—Bill Barr, whose dad had a big ranch up around Chama—insisted he had seen one of the men somewhere before. He stewed about that for days and finally one night we heard him shout from his room: 'I've got it!' We all rushed in and there he sat with his chemistry book open to a picture of E. O. Lawrence with his cyclotron. We had learned a lot of good physics and chemistry from Ferm (Fermor Church of Santa Fe, faculty member and son-in-law of school founder Ashley Pond) so it wasn't hard to figure out what kind of work they'd be doing if Lawrence were involved."

Wainwright and his classmate, Baird Tenney, remember walking around to check out the markers put down by the Army survey teams and figuring out where the Laboratory buildings would be. "I remember there was going to be a huge power plant," Wainwright said.

Wainwright and Tenney, both wearing their original school uniforms, were among the youngest of the returning graduates. Earl Kieselhorst, class of 1923, said he was the oldest living graduate. His brother, Sidney, also left school in 1923 but claimed the distinction of being the first boy to be thrown out of the Los Alamos Ranch School.

"I can remember the four days during the four years I was here that I didn't have any demerits;

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Oldest graduate, Earl Kieselhorst of southern California, class of 1923, found his picture at the Los Alamos Historical Society and helped identify others in the Society's old photographs.

it was always March 17," Sidney said, explaining that School Director A. J. Connell, an Irishman, never gave demerits on St. Patrick's Day. "But my roommates and I would spoil it by congratulating ourselves after lights out and wind up with more demerits for the next day."

Kieselhorst suggested that a Los Alamos building be named for one of the students. "Red Hoffman was actually the first scientist to come to Los Alamos," he said. "He was noted for distilling alcohol from Listerine using the fuel line from a tractor, a wet towel and a bunch of other things." Sidney admitted that the product was not top quality.

Actually, his brother, Earl, pointed out, "The school was a working ranch when we came here and we had to work pretty hard." But there was time for recreation and Earl Kieselhorst won the New Mexico Scholastic Tennis Championship for 1923.

According to many of the alumni, it was A. J. Connell's firm and unyielding ideas about how boys should be educated that made the school so great. For one thing, there was no coddling. Most of the students came to the school suffering from asthma and other infirmities but it made no difference. Regardless of the temperature, every student was required to appear at 6:45 each morning at his assigned spot near the Big House (located near the present Community Center) for 15 minutes of strenuous calisthenics. Shorts, part of a uniform adapted for long-term wear from the Boy Scouts, were required year-round except on horseback when chaps were allowed, and in the last years when riding pants were permitted.

"It was rough but nobody got sick," said Wainwright, who recalled his own transformation from a sickly asthmatic who was ill at least four months of every year to a vigorous outdoorsman who spent no more than three days in the infirmary during his four years at school.

"When A. J. came to our New York apartment to discuss the school with my mother, she began to tell him all the things I couldn't do and couldn't eat, especially eggs which produced a violent reaction. Connell wouldn't listen. He just told mother not to worry. I don't know how it worked, but I do remember ordering scrambled eggs for breakfast on my way home for vacation."

The students spent a great deal of time outdoors, much of it on horseback. They rode out with pack horses to maintain the Hill road and fire trails and for camping expeditions into the mountains and to Camps Hamilton and May. They cut their own ski trails at Sawyers Hill and Camp May and used pack horses to haul their skis to the mountaintop for the run down.

At school they had learned to know the countryside intimately. Now, from the Valle Grande, where Jim Thorpe of Bishop's Lodge in Santa Fe provided a picnic lunch for his schoolmates, they were able to name each peak and pick out familiar landmarks.

During the picnic, Robert MacPherson Wood, now attorney general for the state of Georgia, brought in a string of trout from the same Valle Grande stream he had fished 46 years before.

It was not all nostalgia. To a man, the alumni expressed strong interest in what had transpired on the mesa since the school was closed and enjoyed an extensive tour of LASL's Science Museum before returning to Santa Fe.

Wasn't it painful to return to such a transformation?

"Not really," mused Juvenile Court Judge Joe Ryan of Albuquerque as the alumni browsed in the Science Museum, "but I often wonder if establishing the Laboratory was really worth it. Was all this really worth closing the school and sacrificing the opportunity to turn out more men like these? Was it worth another Stirling Colgate (scientist and now president of New Mexico Institute of Mining and Technology) or another Roy Chapin (chairman of American Motors) for example? Was it really worth it?"

Mr. and Mrs. Robert Stuart of Chicago, left, and Mr. and Mrs. Roy Chapin of Detroit examine an aluminum popper from the Pretty Pinch during their tour of the Bradbury Science Museum. Stuart, president of Quaker Oats, and Chapin, chairman of American Motors, were among the top executives who participated in their school reunion.

short subjects

Clara Peak Road, Pine and Spruce Canyons in the Rabbit Mountain area off St. Peter's Dome Road, and the Fenton Hill/Jemez Springs area have been designated by the U.S. Forest Service for Christmas tree cutting this year.

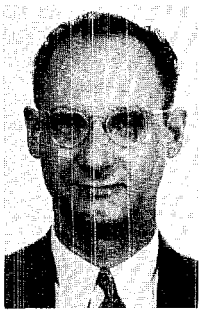
Permits and maps showing boundaries of the tree-cutting areas are available at the Forest Service office in Los Alamos. The office, now located in the former badge office in the lower north side of the AEC building, will be open 7 days a week from 8 a.m. to 5 p.m. until December 24.

Permits cost $1 for trees up to 10 feet tall and $2 for trees between 10 and 20 feet and should be affixed to the tree as soon as it is cut. A Forest Service officer will check permits in the tree-cutting areas.

Approximately 200 persons attended the 7th annual meeting of the Users Group of the Clinton P. Anderson Los Alamos Meson Physics Facility at the Los Alamos Scientific Laboratory in mid-November.

The meeting, which began with a LAMPF status report by **Louis Rosen,** MP-Division leader, included discussions of a variety of research subjects and invited talks by **John Teem,** director of the Division of Physical Research of the Atomic Energy Commission; **Peter Carruthers,** T-Division leader; **Gerry Brown,** State University of New York/Stony Brook; and **Gordon Baym,** University of Illinois. "The Shape of Things to Come in International Scientific Collaboration" was the subject of a banquet talk by Professor **Harrison Brown,** foreign secretary, National Academy of Science.

Harold Butler, alternate MP-1 group leader, was honored as the Distinguished Alumnus of Phillips University during its homecoming celebration November 16 and 17. Butler received his bachelor of science degree from the Enid, Oklahoma school in 1953. He also holds a master's degree from Kansas State University and a Ph.D. degree from Stanford, both in physics.



Schonfeld

Smith

Van Gemert

Fred Schonfeld, CMB-5 group leader, and **Morton Smith,** Q-22 group leader, have been elected Fellows of the American Society of Metals. Both were among 52 ASM members to be honored at a convocation of Fellows at the Society's 1973 Metal Show and Material Engineering Congress in October.

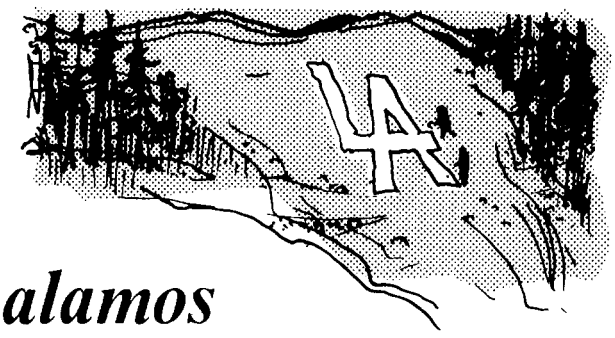
Schonfeld has been engaged in materials research at LASL for more than 26 years, and Smith, formerly with CMB-13, has been with LASL since 1954.

Robert Van Gemert, Supply and Property Department head, received the Harold M. Cosgrove Award for Outstanding Purchasing Management at the 27th Annual Southwestern Purchasing Conference in Houston, Texas, recently. The award was presented "in recognition of outstanding achievements and distinguished service for the advancement of the profession."

Robert Wilson, wartime leader of the Los Alamos Laboratory's Research Division, was among 11 scientists selected to receive the National Medal of Science at the White House on October 10. Wilson, now director of the National Accelerator Laboratory in Batavia, Illinois, came to Los Alamos in 1943 to head the cyclotron group and a year later was chosen to head the newly formed R-Division. He returned to Harvard University in 1946.

The National Medal of Science, established by Congress in 1959, is the federal government's highest award for distinguished achievement in science, mathematics, and engineering.

10 years ago in los alamos



Culled from the November and December, 1963 files
of the LASL News and the Los Alamos Monitor by Robert Porton

County Wins Voting

Reactions were mixed to the referendum in which local voters recommended by a 4-to-1 margin that the townsite gas and electric systems be transferred by AEC to the county government. About 80 per cent of the registered voters expressed their desires at the polls. AEC Manager Charles Campbell said that the Commission "is pleased with the record turnout of voters."

Ten State Governors to Tour Laboratory

Ten state governors will tour LASL. The visitors, accompanied by high federal officials and oil industry representatives, will come from the Interstate Oil Compact Commission holding a meeting in Santa Fe. The group will hear a talk by Laboratory Director Norris Bradbury and will visit the Science Museum and several technical facilities. Included in the list of dignitaries is Governor John Love of Colorado.

Space Sentries Successful

The nuclear burst detection satellites that have been orbiting the earth for more than a month are "performing completely satisfactorily," it was reported at the Los Alamos Scientific Laboratory. LASL scientists, who helped develop the idea for the space-based detection system and designed the radiation sensors, said they are confident the test program can be expanded into an operational "eye in the sky" network.

Shelter Managers Take Course

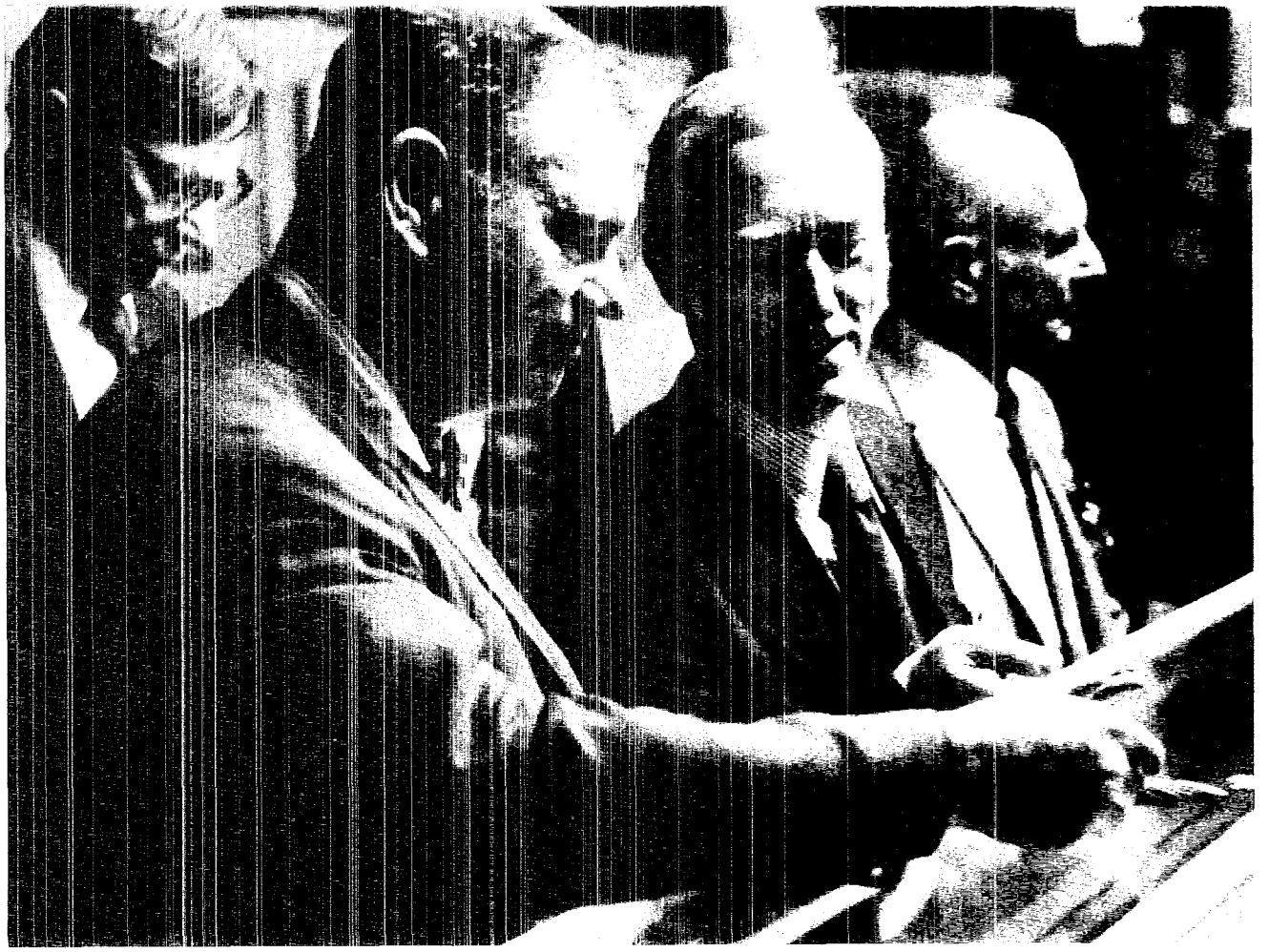
Shelter managers of the Los Alamos Civil Defense organization are undergoing a 9-hour training course. Instruction is being given under the direction of the 3-man Troika which heads the shelter managers organization. More than 165 people are attending the course. Sessions are being conducted in the LASL Administration Building auditorium.

Exit LASL News

The *LASL News* bows out this month and will be replaced by a monthly magazine to be called *The Atom*. The *News* grew out of a 4-page typewritten newsletter, first published in November, 1958. Its name and looks were changed several times along the way but it has been published on a biweekly basis since March, 1959.

Rolling Stones Gather Much Moss

Strong public opinion has been voiced against a group of 7 Los Alamos adults who destroyed a white-washed rock sign spelling "LA" on the side of Burnt Mountain. The sign was built as a project of the high school student body. A week after the destruction some 300 local students and adults combined their efforts and rebuilt the sign. The workers formed long lines to pass rocks hand-to-hand from nearby areas of the steep slope to form a 73- by 100-foot emblem that has caused almost as much talk here as the detonation of the first atomic bomb.



Members of the University of California Scientific Advisory Committee were briefed on a variety of research programs and toured various Laboratory areas during a recent visit to Los Alamos. Examining tungsten Phermex targets at M-2 are committee members Frederick Wall, executive director, American Chemical Society; William McMillan, committee chairman and professor of chemistry, University of California at Los Angeles; John Wheeler, professor of physics, Princeton University; and Lt. Gen. James Doolittle, USAF (Ret.). The committee was established last year to advise University of California President Charles Hitch and the directors of LASL and Lawrence Livermore Laboratory on the performance, programs and plans of the laboratories and to make recommendations regarding the relationship of the laboratories to the rest of the University.

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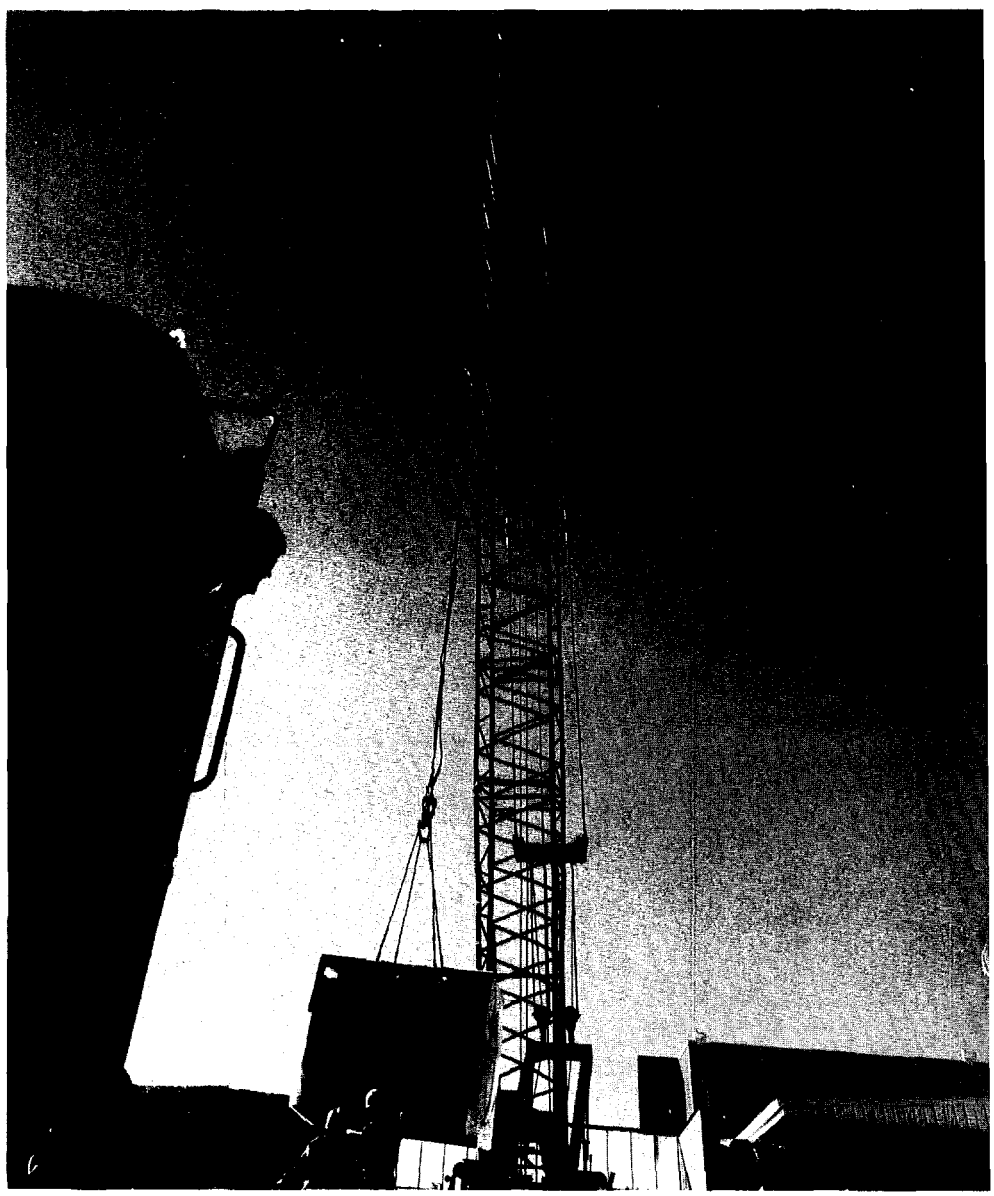

The first assembly of magnets for the biomedical beam line was installed recently at the Clinton P. Anderson Los Alamos Meson Physics Facility. Eventually a series of 11 magnets will bend a beam of negative pions from the main proton beam and direct it to the treatment room of LAMPF's radiobiology and therapy research facility. Tune-up work will begin as soon as the remaining magnets are delivered, hopefully by early 1974. The facility will be used for general biomedical research and for clinical trials of pi-mesons in radiation therapy.